REMARKS

Favorable reconsideration is respectfully requested in view of the foregoing amendments and the following remarks.

At the outset, Applicants thank Examiner Culbert for his time and consideration of the present application during the telephone interview with the undersigned on September 23, 2008.

I. CLAIM STATUS AND AMENDMENTS

Claims 1-17 were pending in this application when last examined and stand rejected.

Claims 1, 16, and 17 are amended to incorporate the subject matter of claim 2. Of course, claim 2 is cancelled without prejudice or disclaimer thereto. Applicants reserve the right to file a continuation or divisional on any cancelled subject matter. Claims 1, 16, and 17 are also amended, in a non-narrowing manner, to better clarify the claim language as supported by the disclosure at page 3, paragraph [025]. Claims 3 and 4 are amended to change their dependency to claim 1. No new matter has been added by the above claim amendments. It should be noted that the claims have been amended along the lines discussed in the interview.

Applicants are submitting the present Amendment without prejudice to the subsequent prosecution of claims to some or all of the subject matter which might be disclaimed by virtue of this paper (although none is believed to be), and explicitly reserve

the right to pursue some or all of such subject matter, in Divisional or Continuation Applications.

II. PRIOR ART REJECTIONS

On pages 2-3 of the Office Action, claims 1-8 and 11-16 were rejected under 35 U.S.C. § 102(b) as anticipated by CHRISTENSEN (U.S. Patent Application Publication 2003/0235985).

On page 4, claims 9, 10, and 17 were rejected under 35 U.S.C. § 103(a) as obvious over CHRISTENSEN et al. in view of BUCHANAN (U.S. Patent Application Publication 2003/0230549).

Applicants respectfully traverse this rejection on the basis that neither CHRISTENSEN nor BUCHANAN nor their combination discloses or suggests each and every element of independent claims 1, 16, and 17.

First, CHRISTENSEN, alone or when combined with BUCHANAN, fails to disclose or suggest that the liquid etchant is dispensed in a continuous flow as a free beam or as a liquid stream onto the substrate and spreads over the surface of the substrate.

As discussed in the interview, it appears the Office has misunderstood or overlooked certain of the arguments in the last response as to how the "disperse flow" in CHRISTENSEN is not a "continuous flow". Yet, the Office argues that CHRISTENSEN discloses dispensing the liquid etchant as a spray, but also as "stream" (paragraph [0042]) or a "flow" (paragraphs [0042-0043]).

The Offices further argues that this disclosure of a "stream" or a "flow" reads on a "continuous flow" as in claim 2.

Applicants respectfully disagree. In this regard, Applicants cannot detect the word "stream" as a description for the liquid dispense flow in paragraph [0042] of CHRISTENSEN (nor in any other part of the document). Applicants can only detect the term "acoustic streaming". However, "acoustic streaming" is a very specific technical term used in ultrasonic cleaning technique (something however, which is merely a theory than something really existing) that is not the same as the "continuous flow as a free beam or a liquid stream" as in amended claims 1, 16, and 17. Further, the term "flow" in paragraph [0043] of CHRISTENSEN is solely used in combination with either "Single wafer spray processor" or "batch spray processor", where the liquid is supplied in the form of small droplets.

By contrast, the term "continuous flow" as Applicants understand it is limited to a single phase/liquid phase flow, which is emphasized with the added terms "as a free beam or as a liquid stream" in the amended claims 1, 16, and 17.

Thus, the term "stream" or "flow" in CHRISTENSEN only refers to a two phase flow, wherein the continuous phase is gas and the disperse phase is liquid. This is clearly indicated by using the equipment "spray processor" and the mentioned term "sprayed" see paragraph [0042]) of CHRISTENSEN. Consequently, in the method of CHRISTENSEN, neither a free beam nor a liquid stream is directed

towards the wafer but rather a plurality of fine drops (mist) is dispensed onto the wafer.

For the above reasons, it is clear that CHRISTENSEN stands in contrast to the methods of amended claims 1, 16, and 17, because the disperse flow spraying small droplets is not the same as, nor is it suggestive of the "continuous flow" of the instant claims. Again, nothing in CHRISTENSEN discloses or suggests that liquid etchant is dispensed in a continuous flow as a free beam or as a liquid stream onto the substrate and spreads over the surface of the substrate as required in claims 1, 16, and 17.

Second, as discussed in the interview, the independent claims have been amended to specify the velocity of the flow. Neither CHRISTENSEN nor BUCHANAN nor their combination discloses or suggests the feature of generating a flow having a mean velocity v parallel to the surface of the substrate of at least 0.1 m/s of amended claims 1, 16, and 17.

Yet, on page 3 of the Action, the Office relies on CHRISTENSEN as allegedly disclosing this feature by stating:

> flowing across the substrate surface at a flow of at least 0.05 L/min (especially at least 0.5 L/min) which is "sufficient fast" to generate a mean velocity v parallel to the substrate's surface of minimum 0.1 m/s as broadly recited by applicant.

Further, in the interview, the Office notes that the instant application at paragraph 27 on page 4 seems to contradict this argument as it discloses that "0.5 lpm/min" is preferred.

Applicants disagree. Dispensing liquid in CHRISTENSEN at a flow rate greater than 0.5 lpm as such is not at all sufficient to generate a mean velocity of 0.1 m/s. This is especially true if such a flow is used in combination with spraying, since it does not help. By contrast, if it is used with a continuous flow as in the instant claims, it is sufficient. This is further illustrated below.

As mentioned above, the term "flow" in paragraph [0043] of CHRISTENSEN is solely used in combination with either "Single wafer spray processor" or "batch spray processor". It is correct that the proposed flow rate for a single wafer wet processor is in the range of 0.5 to 2 lpm. However, the flow rate (volume flow in lpm) does not necessarily correlate to a flow velocity (m/s) across the wafer, when different dispensing techniques shall be compared. The flow rate of a spray does only indicate how much litres per minute is provided to a chamber. The spray partly condenses on the chamber walls and on the wafer. The velocity of a liquid across the wafer in a spray processor however is mostly dependent on how much liquid will actually condenses on the wafer and how it might flow off the wafer.

If a free beam of liquid is directed to the wafer the actual velocity of the liquid flowing across the wafer however can be directly calculated using the following parameters:

Q … volume flow

a … cross sectional area of the dispense nozzle

> Q and a lead to the velocity v_0 when the liquid leaves the dispense nozzle v=Q/a (=> a=Q/v)

The impact velocity v_o is the same as the mean velocity across the wafer if a free beam is used. This is described in paragraphs [0014] through [0022]).

Consequently, when using a flow rate of 0.1 lpm (=1.67E-6 m^3/s) and requiring a velocity of 0.1 m/s, a cross sectional area of 16,67 mm^2 is needed, which leads to a inner nozzle diameter of about 4 mm (in this case the additional acceleration of the liquid beam (as mentioned in equation of paragraph [0016]) when dispensing from above is neglected.

Yet, in paragraph [0027], it has already been mentioned that "the velocity is not primarily depending on the volume flow."

For these reasons, it is submitted that CHRISTENSEN fails to disclose or suggest that for which it is offered. Nothing in CHRISTENSEN discloses or suggests generating such a flow having a mean velocity v parallel to the surface of the substrate of at least 0.1 m/s.

Further, in contrast to the method of claims 1, 16, and 17 of the present application, CHRISTENSEN states (in paragraph [0043]) that:

> The similarity between the etch results noted below in the examples utilizing a small, static volume of etching solution and a centrifugal spray processor with high cross-wafer flow rates indicates that the flow rate of etching solution over the wafer is not critical. [Emphasis added.]

This clearly differs from what Applicants have found. Indeed, it is contrary to the amended claims that requires "dispensing . . . and generating a flow having a mean velocity v parallel to the surface of the substrate of at least 0.1 m/s".

Again, the "mean velocity v parallel to the substrate's surface" in the examples of CHRISTENSEN was simply not high enough. As such, CHRISTENSEN did not realize the fact that selectivity of etching high-k material against silicon dioxide can be created or enhanced as in the method of claims 1, 16, and 17. For these reasons, it is believed that the combination of CHRISTENSEN and BUCHANAN would not yield predictable results to arrive at the claims as required for obviousness.

Third, a further difference between CHRISTENSEN and the method of the instant application is that CHRISTENSEN etches $Hf_xSi_yO_z$ or $Zr_xSi_yO_z$, whereas in a preferred embodiment, Applicants etch HfO_2 or ZrO_2 as a first material that has been pretreated with an energetic particle bombardment. Such a difference in methodology could account for the reason Applicants experienced a different influence on velocity flow and selectivity. See independent claim 17, which emphasizes this difference.

For these reasons, it is submitted that CHRISTENSEN fails to disclose or suggest that for which it is offered and by doing so, the reference fails to disclose or suggest each and every element of independent claims 1, 16, and 17.

The secondary reference of BUCHANAN fails to rectify the deficiencies in CHRISTENSEN.

BUCHANAN was relied upon for disclosing pretreatment consisting of energetic particle bombardment prior to wet etching high-k metal oxides using fluoride or HF silicon oxide for the purpose of damaging the metal oxide and increase etch rate. However, such a teaching in no way discloses or suggests the above-noted features of claims 1, 16, and 17 that distinguish over CHRISTENSEN. Thus, BUCHAHAN does not remedy the deficiencies in CHRISTENSEN.

Thus, Applicants respectfully submit that the Office has failed to show that the combination of CHRISTENSEN and BUCHANAN could provide for all the claimed elements and that one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions to yield predictable results.

For these reasons, CHRISTENSEN cannot anticipate the claims and the combination of CHRISTENSEN and BUCHANAN cannot render obvious the claims. Accordingly, independent claims 1, 16, and 17 are novel and unobvious over the CHRISTENSEN, alone or when combined with BUCHANAN. Likewise, the dependent claims are also novel and unobvious over the combined references in view of their dependency on claim 1.

Therefore, Applicants respectfully submit that CHRISTENSEN, alone or when combined with BUCHANAN, fails to disclose or each

and every element of independent claims 1, 16, and 17. Accordingly, neither anticipation nor obviousness of the claims in the case can be established, on the basis of CHRISTENSEN, alone or in combination with BUCHANAN. Thus, withdrawal of the above-noted anticipation and obviousness rejections is solicited.

III. CONCLUSION

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is in condition for allowance and notice to that effect is respectfully requested. If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned attorney at the telephone number below.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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